UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

20 SEP 2004

Mr. Alan Pollock, Acting Director
Division of Water Program Coordination
Virginia Department of Environmental Quality
629 Main Street
Richmond, VA 23219

Dear Mr. Pollock:

The United States Environmental Protection Agency (EPA) Region III is pleased to approve the Total Maximum Daily Loads (TMDLs) for the primary contact and aquatic life (benthic) use impairments on Bluestone River. The TMDLs were submitted to EPA for review in April 2004 with revisions sent in July 2004. The TMDLs were established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address an impairment of water quality as identified in Virginia's 1996 Section 303(d) list.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) designed to attain and maintain the applicable water quality standards, (2) include a total allowable loading and as appropriate, wasteload allocations (WLAs) for point sources and load allocations for nonpoint sources, (3) consider the impacts of background pollutant contributions, (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated), (5) consider seasonal variations, (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality), (7) consider reasonable assurance that the TMDL can be met, and (8) be subject to public participation. The enclosure to this letter describes how the TMDLs for the aquatic life and primary contact use impairments satisfy each of these requirements.

Following the approval of these TMDLs, Virginia shall incorporate the TMDLs into the Water Quality Management Plan pursuant to 40 CFR § 130.7(d)(2). As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL WLA pursuant to 40 CFR §122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

SEP 23 2004

If you have any questions or comments concerning this letter, please don't hesitate to contact Mr. Peter Gold at (215) 814-5236.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

Decision Rationale

Total Maximum Daily Loads for the
Primary Contact (Bacteriological) and Aquatic Life Use Impairments on Bluestone River

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document will set forth the Environmental Protection Agency's (EPA's) rationale for approving the TMDLs for the primary contact (bacteriological) and aquatic life use impairments on Bluestone River. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

1) The TMDLs are designed to implement applicable water quality standards.
2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
3) The TMDLs consider the impacts of background pollutant contributions.
4) The TMDLs consider critical environmental conditions.
5) The TMDLs consider seasonal environmental variations.
6) The TMDLs include a margin of safety.
7) There is reasonable assurance that the TMDLs can be met.
8) The TMDLs have been subject to public participation.

II. Background

The Bluestone River Watershed is located in Tazewell County, Virginia and Mercer County, West Virginia. The Bluestone River is a tributary to the New River. The bacteriological and benthic impairments on Bluestone River extend 13.2 miles from the Wrights Valley confluence, near the western Bluefield city limit, to the Virginia/West Virginia state line at river mile (RM) 20.94. The Bluestone River watershed (USGS Hydrologic Unit Code #05050002) is part of the New River Basin. The land area of the affected watershed is approximately 49,000 acres with forest/wetland and agricultural lands make up 72.6 and 19.3 percent of the watershed, respectively. Residential and commercial lands making up the remainder of the watershed.

In response to Section 303(d) of the CWA, the Virginia Department of Environmental Quality (VADEQ) listed 13.2 miles of Bluestone River (VAS-N36R) on Virginia's 1996 Section

303(d) list as being unable to attain the primary contact use and aquatic life use. Virginia's decision to list the Bluestone River for these impairments was based on observed violations of the Commonwealth's bacteriological criteria and assessments of the biological assemblage. At the time of its listing, the Virginia bacteria criteria used fecal coliform as an indicator species and had an instantaneous standard 1,000 colony forming units (cfu) per 100 milliliters (ml) and geometric mean standard of 200 cfu/100ml. This decision rationale will address the TMDLs for both impairments.

Virginia developed the Bluestone River TMDL in cooperation with West Virginia since the Bluestone River is also included on West Virginia's Draft 2004 Section 303(d) list for fecal coliform impairment. Within the Bluestone River watershed, West Virginia also lists tributaries due to fecal coliform, iron, manganese, aluminum, pH, and/or biological impairments. Virginia's TMDL for the Bluestone River makes the assumption that waters crossing the West Virginia-Virginia border are meeting West Virginia's fecal coliform bacteria criteria. All bacteria allocations described in the TMDL apply solely to Virginia lands and waters. Virginia's TMDL also presents gross sediment allocations for the West Virginia portion of the Bluestone River watershed providing the necessary framework for future TMDL development to address specific impairments in West Virginia. A one year "pre-TMDL" monitoring effort in the West Virginia portion of the Bluestone River watershed will be completed from July 1, 2004 to June 30, 2005. West Virginia will complete necessary TMDLs in the Bluestone River watershed by December 31, 2007. West Virginia's TMDL process is further described in Section 10.2 of the TMDL report.

Bacteria

Fecal coliform is a bacterium which can be found within the intestinal tract of all warm blooded animals. Therefore, fecal coliform can be found in the fecal wastes of all warm blooded animals. Fecal coliform in itself is not a pathogenic organism. However, fecal coliform indicates the presence of fecal wastes and the potential for the existence of other pathogenic bacteria. The higher concentrations of fecal coliform indicate the elevated likelihood of increased pathogenic organisms.

EPA encouraged the states to use e-coli and enterococci as the indicator species instead of fecal coliform. A better correlation was drawn between the concentrations of e-coli and enterococci, and the incidence of gastrointestinal illness. The Commonwealth adopted e-coli and enterococci criteria in January 2003. According to the new criteria, streams will be evaluated via the e-coli and enterococci criteria after 12 samples have been collected using these indicator species. The fecal coliform criteria will be used in the interim. Twelve e-coli samples were collected from Bluestone River and it is therefore assessed according to the new criteria.

As Virginia designates all of its waters for primary contact, all waters are required to meet the bacteriological standard for primary contact. Virginia's standard applied to all streams designated as primary contact for all flows. The e-coli criteria requires a geometric mean concentration of 126 cfu/100ml of water with no sample exceeding 235 cfu/100 ml of water.

Unlike the new fecal coliform criteria, which allows for a 10% violation rate, the new e-coli criteria requires the concentration of e-coli not to exceed 235 cfu/ 100ml of water.

Although the TMDL and criteria require the 235 cfu/100 ml of water concentration limit not be exceeded, waters are not placed on the Section 303(d) list if their violation rate does not exceed 10%. Therefore, Bluestone River may be deemed as attaining its primary contact use prior to the implementation of all of the TMDL reductions. It is necessary to keep this in mind because of the reductions required to attain the instantaneous criteria for e-coli in the model are extremely stringent.

West Virginia's fecal bacteria standards are based on fecal coliform. However, the resulting water quality endpoints are nearly identical to those of Virginia. For development of this TMDL, it was assumed that waters crossing the West Virginia-Virginia border were meeting the West Virginia standard. All bacteria allocations described here apply solely to Virginia lands and waters.

Benthic

To assess the biological integrity of a stream, Virginia uses EPA's Rapid Bioassessment Protocol II (RBPII) to determine status of a stream's benthic macroinvertebrate community.[1] This approach evaluates the benthic macroinvertebrate community between a monitoring site and its reference station. Measurements of the benthic community, called metrics, are used to identify differences between monitored and reference stations.[2] The state is currently in the process of changing this methodology to a stream condition index (SCI) approach.

As part of the RBPII approach, reference stations are established on streams which are minimally impacted by humans and have a healthy benthic community. These reference stations represent the desired community for the monitored sites. Monitored sites are evaluated as non-impaired, slightly impaired, moderately impaired, or severely impaired based on a comparison of the biological community of the reference and monitored sites. Streams that are classified as moderately (after a confirmatory assessment) or severely impaired after an RBPII evaluation are classified as impaired and are placed on the Section 303(d) list of impaired waters. Bluestone River was assessed as moderately impaired.

The RBPII analysis assesses the health of the macroinvertebrate community of a stream. The analysis will inform the biologist if the stream's benthic community is impaired. However, it will not inform the biologist as to what is causing the degradation of the benthic community. Additional analysis is required to determine the pollutants which are causing the impairment. TMDL development requires the identification of impairment causes and the establishment of

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[1]Tetra Tech 2002. Total Maximum Daily Load (TMDL) Development for Blacks Run and Cooks Creek. Fairfax, Virginia.

[2]Ibid 1

numeric endpoints that will allow for the attainment of designated uses and water quality criteria.[3] A reference watershed approach was used to determine the numeric endpoints for Bluestone River. Numeric endpoints represent the water quality goals that are to be achieved through the implementation of the TMDL which will allow the impaired water to attain its designated use. A reference watershed approach is based on selecting a non-impaired watershed that shares similar landuse, ecoregion, and geomorphological characteristics with the impaired watershed. The stream conditions and loadings in the reference stream are assumed to be the conditions needed for the impaired stream to attain standards.

Since the state is switching to the SCI for biological assessments, the TMDL modelers evaluated Bluestone River based on the SCI. Unlike the RBPII analysis, the SCI has a scoring system based on a statistical analysis of a large benthic database.[4] Therefore, the SCI does not evaluate the benthic community on a one to one basis but evaluates the monitored community against the condition of several nonimpaired waters at once. The results using the SCI method were similar to the findings using RBPII.

Computational Procedures

The TMDL submitted by Virginia is designed to determine the acceptable load of e-coli which can be delivered to the impaired segment, as demonstrated by the Hydrologic Simulation Program Fortran (HSPF), in order to ensure that the water quality standard is attained and maintained. HSPF is considered an appropriate model to analyze the impaired water because of its dynamic ability to simulate both watershed loading and receiving water quality over a wide range of conditions. The model was run to determine the fecal coliform loading to Bluestone River. A translator equation was used to convert fecal coliform results to E-coli.

The TMDL analysis allocates the application/deposition of fecal coliform to land based and instream sources. For land based sources, the HSPF model accounts for the buildup and washoff of pollutants from these areas. Buildup (accumulation) refers to all of the complex spectrum of dry-weather processes that deposit or remove (die-off) pollutants between storms.[5] Washoff is the removal of fecal coliform which occurs as a result of runoff associated with storm events. These two processes allow the model to determine the amount of fecal coliform from land based sources which is reaching the stream. Point sources and wastes deposited directly to the stream were treated as direct deposits. Wastes which are deposited directly to the stream do not need a transport mechanism.

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[3]Ibid 1

[4] MapTech, 2004, General Standard Total Maximum Daily Load Development for Unnamed Tributary to Deep Creek.

[5]CH2MHILL, 2000. Fecal Coliform TMDL Development for Cedar, Hall, Byers, and Hutton Creeks Virginia,

Local rainfall and temperature data were needed to develop the model. Weather data provides the rainfall data which drives the TMDL model. Weather data was obtained from Wytheville Station #449301 for the bacteria TMDL. For the benthic TMDL, weather data was obtained from Wytheville Station #449301, Burke Garden Station #441209, and Dale Enterprise Station #442208.

Continuous stream flow data was available for Bluestone River at USGS gaging station #0317770 (Bluestone River at Falls Mills, Virginia). The model was developed to this USGS gage station for the bacteria TMDL. The results of the Bluestone River hydrology model were compared to 30-minute flow data collected from USGS station 03171170. Flow data for this station was available from 1980 through 1997. The watershed was divided into nine segments for the model. The bacteria loading model was calibrated and validated against observed data from the VADEQ monitoring stations within the Bluestone River Watershed.

The benthic TMDL was developed using the Generalized Watershed Loading Function model (GWLF). The GWLF model provides the ability to simulate runoff, sediment, and nutrient loadings from watersheds given variable source areas (e.g., agricultural, forested, and developed land).[6] GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations.[7] Calculations are made for sediment based on daily water balance totals that are summed to give monthly values. A reference watershed approach was used to estimate the necessary load reduction needed to restore a healthy aquatic community and allow the streams in the Bluestone River watershed to achieve their designated uses. Dry River watershed in Rockingham County was selected as the reference watershed for Bluestone River. To equate the reference watershed with the monitored watersheds, the reference watershed was decreased in size to that of the impaired watershed in the model, the land uses were proportionally decreased based on the percent land use distribution. Therefore, the land use breakdown in the reference watershed remained constant. Gross sediment allocations were provided to West Virginia.

Table 1 - Summarizes the Specific Elements of the TMDLs.

Segment	Parameter	TMDL	WLA	LA	MOS
Bluestone River	E-coli (cfu/yr)	4.36E+13	9.41E+12	3.42E+13	Implicit
Bluestone River	Sediment (T/yr)	6,364	81.4	5,647	636

The United States Fish and Wildlife Service has been provided with copy of these

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[6]Ibid 1

[7]Ibid 1

TMDLs.

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the eight basic requirements for establishing a primary contact (bacteriological) and aquatic life (benthic) use impairment TMDLs for Bluestone River. EPA is therefore approving these TMDLs. EPA's approval is outlined according to the regulatory requirements listed below.

1) The TMDLs are designed to meet the applicable water quality standards.

Bacteria

Virginia has indicated that excessive levels of fecal coliform due to nonpoint sources (both wet weather and directly deposited nonpoint sources) have caused violations of the water quality criteria and designated uses on Bluestone River. The water quality criterion for fecal coliform was a geometric mean 200 cfu/100ml or an instantaneous standard of no more than 1,000 cfu/100ml. Two or more samples over a thirty-day period are required for the geometric mean standard. Since the state rarely collects more than one sample over a thirty-day period, most of the samples were measured against the instantaneous standard. Approximately 28 percent of the samples collected from the three monitoring stations on Bluestone River violated the old fecal coliform criteria. Based on the interim fecal coliform criteria the violation rate increases to 54 percent. Approximately 58 percent of the samples collected during TMDL development violated the new e-coli criteria.

The Commonwealth has changed its bacteriological criteria as indicated above. The new criteria require that the fecal coliform concentration not exceed a geometric mean of 200 cfu per 100 ml of water for two or more samples collected over a month nor shall more than 10% of the total samples exceed 400 cfu/100 ml of water. The new e-coli criteria requires a geometric mean of 126 cfu/100ml of water with no sample exceeding 235 cfu/100 ml.

Although West Virginia's fecal bacteria standards are based on fecal coliform, the resulting water quality endpoints are nearly identical to those of Virginia. For development of this TMDL, it was assumed that waters crossing the West Virginia-Virginia border were meeting the West Virginia standard. All bacteria allocations described here apply solely to Virginia lands and waters. West Virginia is moving ahead with its own TMDL process for the Bluestone River watershed. Specifics of the load reduction for the West Virginia portion of the study area will be determined through the process described in Section 10.2 of the TMDL report.

The HSPF model was used to determine the fecal coliform deposition rates to the land as well as loadings to the stream from direct deposit sources. Once the existing load was determined, allocations were assigned to each source category to develop a loading pattern that would allow Bluestone River to support the e-coli water quality criterion and primary contact use. The following discussion is intended to describe how controls on the loading of e-coli to

Bluestone River will ensure that the criterion is attained.

The TMDL modelers determined the fecal coliform production rates within the watershed. Data used in the model was obtained from a wide array of sources, including farm practices in the area, the amount and concentration of farm animals, animal access to the stream, wildlife in the watershed, wildlife fecal production rates, landuses, weather, stream geometry, etc.. The model combined all of the data to determine the hydrology and water quality of the stream. The lands within the watersheds were categorized into specific landuses. The landuses had specific loading rates and characteristics that were defined by the modelers. Therefore, the loading rates are different in lands defined as forested versus pasture. Pasture lands support cattle and are influenced differently by stormwater runoff.

The Bluestone River TMDL model was run using weather data collected from the Wytheville Station #449301 weather station in Wythe County. This data was used to determine the precipitation rates in the watershed which transport land deposited pollutants to the stream through overland and groundwater flow. Waste that was deposited to the land or stored was subjected to a die-off rate. The longer fecal coliform stayed on the ground the greater the die-off was. Materials that were washed off the surface shortly after deposition were subjected to less die-off. The hydrology model of the TMDL was calibrated/validated for hydrologic accuracy using 30-minute flow data collected USGS monitoring station #03177710 (Bluestone River at Falls Mills). The water quality model for bacteria was calibrated to observed data collected from Bluestone River.

Through the development of this and other similar TMDLs, it was discovered that natural conditions (wildlife contributions to the streams) could cause or contribute to violations of the bacteria criteria. BST sampling data collected on Bluestone River indicated that bacteria from wildlife represents a significant portion of the instream load. Many of Virginia's TMDLs, including the TMDL for Bluestone River, have called for some reduction in the amount of wildlife contributions. EPA believes that a significant reduction in wildlife is not practical and will not be necessary due to the implementation plan discussed below.

A phased implementation plan will be developed for all streams in which the TMDL calls for reductions in wildlife. In Phase 1 of the implementation, the Commonwealth will begin implementing the reductions (other than wildlife) called for in the TMDL. In Phase 2, which can occur concurrently to Phase 1, the Commonwealth will consider addressing its standards to accommodate this natural loading condition. The Commonwealth has indicated that during Phase 2, it may develop a Use Attainability Analysis (UAA) for streams with wildlife reductions which are not used for frequent bathing. Depending upon the result of the UAA, it is possible that these streams could be designated for secondary contact.

After the completion of Phase 1 of the implementation plan, the Commonwealth will monitor the stream to determine if the wildlife reductions are actually necessary, as the violation level associated with the wildlife loading may be smaller than the percent error of the model. In

Phase 3, the Commonwealth will investigate the sampling data to determine if further load reductions are needed in order for these waters to attain standards. If the load reductions and/or the new application of standards allow the stream to attain standards, then no additional work is warranted. However, if standards are still not being attained after the implementation of Phases 1 and 2, further work and reductions will be warranted.

Benthic

As stated above, the biological assessments on Bluestone River were not able to discern a clear stressor to the River. The TMDL modelers therefore conducted a stressor identification analysis to determine what was impacting the benthic community. Ambient water quality data was able to rule out dissolved oxygen (DO), temperature, pH or toxics as the stressors to Bluestone River. Although elevated levels of nutrients were observed, this stressor was ruled out based on an analysis of the DO data and the results of a diurnal DO study, since excessive nutrient loadings to the stream were expected to manifest themselves in low DO levels which were not observed. Sediment was seen as the stressor to Bluestone River. Excessive sediment loadings can destroy critical habitat areas, clog an organisms gills and respiratory ability, and lower the instream visibility for predators. Nutrient loads to Bluestone River should be reduced by the controls placed on sediment reaching the stream. Habitat assessments on Bluestone River drew a similar conclusion with low embeddedness and riparian vegetation scores illustrating the filling of habitat areas, the smothering of the benthic community, and the source of the sediment. VADEQ staff noted that, upstream of the Town of Bluefield, the streambanks had poor structure due to livestock access to the streams. In addition, Dill Spring has significant sediment deposits in the vicinity of Bluefield's raw water intake. Urban runoff, construction activity and agricultural activity are, therefore, the most likely sources.

The GWLF model was used to determine the loading rates of sediment to the impaired and reference stream from all point and nonpoint sources. The TMDL modelers determined the sediment loading rates within each watershed. Data used in the model was obtained on a wide array of items, including land uses in the area, point sources in the watershed, weather, stream geometry, etc..

The GWLF model provides the ability to simulate runoff and sediment loadings from watersheds given variable source areas (e.g., agricultural, forested, and developed land). GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations.[8] To equate the reference watershed (Dry River) with the monitored watershed, the reference watershed was decreased in size to that of the Bluestone River in the model. Each land-use was decreased in equal proportion, insuring that the land use breakdown in the reference watershed remained constant. Local rainfall and temperature data were needed to simulate the hydrology, this data was obtained from the Wytheville and Burke Garden weather stations for the Bluestone River model and from the Dale Enterprise weather station for the Dry River model. In the GWLF model, the nonpoint source load calculation is affected by terrain conditions, such as

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[8]Ibid 1

the amount of agricultural land, land slope, soil erodibility, and farming practices used in the area.[9] Parameters within the model account for these conditions and practices. Daily stream flow data obtained from USGS gaging stations in Bluestone River and Dry River were used for calibrating the GWLF model within the impaired and reference watersheds. The GWLF was developed to be used on watersheds without gage data.

2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of bacteria and sediment to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 1 of this document. The total allowable load is calculated on an annual basis.

Virginia's TMDL for the Bluestone River makes the assumption that waters crossing the West Virginia-Virginia border are meeting West Virginia's bacteria criteria. All fecal coliform allocations described in the TMDL apply solely to Virginia lands and waters. Virginia's TMDL also presents gross sediment allocations for the West Virginia portion of the Bluestone River watershed providing the necessary framework for future TMDL development to address specific impairments in West Virginia. West Virginia's TMDL development process is described in Section 10.2 of the TMDL report.

Waste Load Allocations

Nine regulated facilities were identified as discharging to the Bluestone River Watershed. There are two wastewater/sewage treatment plant discharge permits, two industrial stormwater discharge permits, and five industrial stormwater discharge permits located within the watershed. There are currently no construction stormwater discharge permits or MS4 storm sewer discharge permits in the watershed. The two wastewater/sewage treatment plant discharge permits are permitted for fecal control with allocations equivalent to their current permit levels (i.e., design flow and 126 cfu/100 ml e-coli). The remaining seven regulated facilities are not permitted for fecal control, therefore, the allocation for these sources is zero cfu/100 mL. For sediment, all nine facilities were provided with waste load allocations equivalent to their current load with no reductions required. Table 2 lists the WLAs for the facilities within the watershed.

EPA regulations require that an approvable TMDL include individual waste load allocations (WLAs) for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or

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[9]Ibid 1

both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR 130.7." Furthermore, EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source.

Table 2 - WLAs for Bluestone River

Facility	Permit Number	Permit Type	E-Coli (cfu/yr)	Sediment (T/yr)
Thistle Foundry and Machine Company	VAR0510098	Industrial Stormwater	0.0	0.95
Floyd Asphalt Paving Company Inc	VAR0510047	Industrial Stormwater	0.0	0.67
Bluefield Westside WWTP	VA0025054	Wastewater Treatment Plant	9.23E+12	73.17
Tazewell County PSA/Falls Mills-Hales Bottom STP	VA0062561	Sewage Treatment Plant	1.88E+11	4.48
Boxley Materials Company Bluefield Ready Mix	VAG110001	Industrial Wastewater	0.0	0.75
Fast Stop	VAG750008	Industrial Wastewater	0.0	1.10
Mike's Soft Cloth	VAG750032	Industrial Wastewater	0.0	0.099
MASH Car Wash	VAG7500067	Industrial Wastewater	0.0	0.066
Pounding Mill Quarry Corporation/Bluefield Plant	VAG840021	Industrial Wastewater	0.0	0.083

Load Allocations

According to Federal regulations at 40 CFR 130.2(g), load allocations (LAs) are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings of bacteria, VADEQ used the HSPF model to represent the impaired watersheds. The HSPF model is a comprehensive modeling system for the simulation of watershed hydrology, point and nonpoint source loadings, and receiving water quality. HSPF uses precipitation data for continuous and storm event simulation to determine total loading to the impaired segments from

the various land uses within the watershed.

For the sediment TMDL the GWLF model was used to ascertain the sediment loading to Bluestone River. This model provides the monthly sediment load to the stream through the use of the universal soil loss equation (USLE). The USLE derives the sediment loading by using information on precipitation rates, best management practices, land slope, and vegetative cover. Table 3a and 3b list the LAs for Bluestone River. Gross sediment allocations to West Virginia are also included on Table 3b.

Table 3a - LA for Bacteria (E-coli) for Bluestone River

Source Category	Existing Load (cfu/yr)	Allocated Load (cfu/yr)	Percent Reduction
Residential	6.42E+14	6.42E+12	99
Commercial	2.61E+13	2.61E+11	99
Barren	6.10E+12	6.10E+10	99
Cropland	5.93E+13	5.93E+11	99
Livestock Access	3.32E+14	3.32E+12	99
Pasture	1.50E+15	1.50E+13	99
Forest	8.87E+14	2.31E+14	74
Water	0.00E+00	0.00E+00	0
Livestock - Direct	2.42E+13	0.00E+00	100
Wildlife - Direct	3.05E+12	3.05E+12	0
Straight Pipes and Sewer Overflows	2.40E+11	0.00E+00	100

Table 3b - LA for Sediment for Bluestone River including gross sediment allocations for West Virginia.

Source Category	Existing Load (T/yr)	Proposed Load (T/yr)	Percent Reduction
Transitional	265.7	106.3	60
Forest	161.5	161.5	0
Disturbed Forest	628.0	314.0	50
Cropland and Hay	1612.4	1290.7	20
Pastureland	2287.2	1601.0	30
Stream Edge Access	35.5	1.8	95
Developed	122.5	122.5	0
Channel Erosion	510.7	255.4	50
VA Load - Including WLA	5704.9	3934.6	31
WV Load - Including WLA	2376.3	1712.0	28

3) The TMDLs consider the impacts of background pollution.

The TMDL considers the impact of background pollutants by considering the bacteria and sediment loadings from background sources like wildlife.

4) The TMDLs consider critical environmental conditions.

According to EPA's regulation 40 CFR 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Bluestone River is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[10]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow

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[10]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

(7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

The HSPF and GWLF models were run over a multi-year period to insure that they accounted for a wide range of climatic conditions. The allocations developed in these TMDLs will therefore insure that the criteria are attained over a wide range of environmental conditions including wet and dry weather conditions.

5) The TMDLs consider seasonal environmental variations.

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods.

Bacteria and sediment loadings also change during the year based on crop cycles, waste application rates, vegetative cover and cattle access patterns. Consistent with the discussion regarding critical conditions, the HSPF and GWLF models and TMDL analysis effectively considered seasonal environmental variations through the use of observed weather data over an extended period of time and by modifying waste application rates, crop cycles, and livestock practices.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Virginia included an implicit MOS in the bacteria TMDL through the use of conservative modeling assumptions in the determination of bacteria loadings from point sources and the land application of biosolids. An explicit MOS for the sediment TMDL was developed by removing 10% of the loading and assigning it to the MOS.

7) There is a reasonable assurance that the TMDLs can be met.

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint

Source Program. There is also overlap between the BMPs used for reducing these pollutants. Removing the cattle from the stream will reduce both the bacteria and sediment loads to the stream.

8) The TMDLs have been subject to public participation.

During the development of the TMDL for the Bluestone River watershed, public involvement was encouraged through several meetings to discuss and disseminate the Bluestone River TMDL. A basic description of the TMDL process and the agencies involved was presented at a kickoff meeting on May 28, 2003 at the Virginia Avenue United Methodist Church Fellowship Hall in Bluefield, Virginia with 25 people in attendance. The New River Roundtable Agricultural Subcommittee met on August 9, 2003. The first public meeting was held on September 11, 2003 at the Virginia Avenue United Methodist Church Fellowship Hall in Bluefield, Virginia with 31 people in attendance. On March 18, 2004, the final public meeting was held at the Virginia Avenue United Methodist Church Fellowship Hall in Bluefield, Virginia with 31 people in attendance. The first and final public meetings were both noticed in the Virginia Register and open to a thirty-day public comment period. No written comments were received.